

USDA Warehousing Standards

1. Perishable Food Products, Chilled and Frozen Storage

All chilled and frozen food products are highly perishable and subject to rapid deterioration when improperly stored. Lack of proper temperature, humidity, air circulation and sanitation will result in rapid spoilage and eventual loss of product. Microorganisms, particularly certain species of bacteria and fungi, cause most spoilage of chilled and frozen food products. The contamination spreads rapidly from the decayed items to other contact areas. Frequent inspections while in storage, followed by sorting and removal of the decayed items, will keep losses to a minimum. Upon receipt, food products should be separated and date-stamped so that the oldest food products, as packed not as received, are issued first. Occasionally, regardless of the date stamped, it may become necessary to issue some food products quickly to avoid loss by spoilage. Older chilled or frozen food products should not be allowed to accumulate in storage rooms. Frozen products should not be accepted in a partially thawed condition, nor should such products be refrozen after having been thawed.

a. Temperature

The storage temperature for all frozen food products should be at 0°F or below. During transport the temperature should not be higher than 10°F. Temperatures for chilled storage (refrigerated) should be kept between 35° to 40°F. Dry storage areas should be kept between 50°F to 70°F. There must be thermometers in all frozen areas, chilled storage areas, and dry storage areas.

b. Humidity

Humidity within all storage areas must be controlled to prevent rapid deterioration in the quality of foods. Microorganisms require adequate moisture to grow and multiply. Yeast, mold, and/or bacteria grow in a specific humidity range. There is less bacteria and enzyme action at lower temperatures and humidity. Humidity ranges represent the ranges which best inhibit the gain or loss of moisture in the item. Storage at higher relative humidity may allow water to condense on or be absorbed into the item, while at lower relative humidity the item may dry or shrink.

c. Air Circulation

Air circulation is an important factor in the proper storage of food products. Products should be stacked on pallets, which will provide a 4-inch wall clearance, 2-foot ceiling clearance, and sufficient working aisle space.

d. Food Quality

Average storage periods for frozen items are based on the assumption that products when delivered to the government were procured and processed meeting specifications and were in good condition when transported from warehouse to program recipients.

e. Packaging

The nature and condition of the commodity packages are important factors, which influence storage life expectancy. Packaging materials should be moisture and vapor proof to prevent dehydration, discoloration, odor absorption, loss of flavor, and oxidation. Crushed or torn packaging detracts from the quality and appearance of stored product. All donated products should be presentable before storing or distributing.

f. Detection of Deterioration

Deterioration due to time in storage and variations in temperatures can be detected by periodic inspection. Look for such defects as dehydration (freezer burn), undue softness or mealy texture, discoloration, off odor, evidence of weeping, evidence of rancidity and/or mold.

2. Semi-perishable Food Products in Dry Storage

The term semi-perishable food products refers to food items that are canned, dried, dehydrated or otherwise processed to the extent that such items may, under normal conditions, be stored in non-refrigerated spaces. Semi-perishable food products should not be regarded as non-perishable food products, which do not require care or protection in storage. While semi-perishable food products are not nearly as susceptible to spoilage as perishable food products, spoilage can and will occur if the products are mishandled, improperly stored, or stored for excessive periods of time. It is important to remember that the length of storage should be based on the pack date and not on the date of receipt.

a. Storage

Careful correct storage methods not only prevent damage to items in storage but also assure speed and efficiency in the receipt, handling and issue of items. As in chilled and frozen food products, semi-perishable food products should be separated and date-stamped so that the oldest food products, as packed and not as received, are issued first. The particular method used for storing each item depends on the nature of the container, the nature of the commodity, and the bursting or breaking strength of the bottom layers. Food products on hand, stored beyond the recommended storage period, should be inspected carefully for spillage, bulging, leakage, or other damage. If found in good condition, they should be issued immediately for consumption.

b. Precautions Storage

Items should not be stacked to a height that would cause bursting or crushing of the bottom layers. Stacking in close proximity to steam or other heated pipes should be avoided. Pallets should be used to raise food products off the floor and individual lots piled to permit the circulation of air around the lots. Bagged items and those requiring fumigation and insect control should not be stored in large masses in corners of the storeroom or directly against the walls, leaving insufficient room for cleaning and inspection. Palletized storage is used to facilitate handling of the food products and reduce loss by breakage. All items should be properly cross-stacked to keep the stack solid and prevent it from toppling.

c. Causes of Spoilage

All foodstuffs are subject to varying degrees of natural deterioration. This deterioration is inherent in the food itself and should not be confused with the action of microorganisms, chemical agents or other outside agents. The basic principle of storage is first-in/first-out (FI/FO). The oldest lot(s) determined by pack date not delivery date, should always be used first.

d. Insects: Roaches, Flies, Weevils, and Moths

Insects can cause great damage to stored food and may attack both raw and processed food. Food stored at temperatures between 60°F and 90°F is especially attractive to insects. Infested supplies must be segregated, inspected, documented, and destroyed. Cornmeal is particularly susceptible to insect infestation and rancidity. Roaches and flies not only contaminate the foods but spread disease. Regularly scheduled pest extermination should be performed with strict adherence to regulatory rules and state laws.

e. Rodents: Rats and Mice

Rodents not only physically destroy food by feeding, chewing, and cutting the bags for nests or nesting material, but also contaminate food with their excrement and hairs. Rodents are carriers of filth and disease; therefore, controlling these pests is important. The most effective method of control is to prevent entry of these animals.

f. Freezing

Canned, dehydrated or low moisture foods may undergo accidental freezing if stored in warehouses where temperature controls fail during winter months in cold climates. Freezing usually does not harm these products. If foods containing large amounts of water, such as canned products, are frozen, their usefulness and palatability probably have not been harmed. However, the physical appearance may suffer due to change in consistency and texture (softening). Cheese and butter may separate when frozen, but the

food is not spoiled. Dry products such as grain, flour, sugar, cereals, and dehydrated foods are generally stored in non-refrigerated areas but can be stored in refrigerated areas if humidity can be maintained at 50% to 60%. Increased humidity may cause caking.

g. Temperature

A high temperature over long periods of time is detrimental to keeping to almost all food products. High storage temperatures encourage bacterial growth, mold growth, and insect infestation and are particularly dangerous when accompanied by high humidity. Chemical action is accelerated causing rancidity in many items. Action of the food acids, naturally present within the cans, is accelerated resulting in pinholing, blackening of the interior and hydrogen swells. Flour and associated products (barley, cereals, cornmeal, cornstarch, crackers and biscuits, hominy, noodles, oats, rice spaghetti and macaroni, tapioca, and uncooked wheat) are subject to insect infestation particularly at high temperatures. Flour and cereals will absorb odors and should be kept away from materials giving off distinctive odors.

h. Humidity

High humidity is detrimental to stored food products in many respects by accelerating the growth of bacteria and molds, promoting insect infestation and causing mustiness in flour, rice, and similar foods. High humidity causes products, which readily absorb moisture, such as sugar and salt, to cake and become hard.

i. Ventilation

Where sharply fluctuating temperatures and high humidity prevail, the lack of proper ventilation may cause excessively high temperatures. Proper ventilation is one of the most important factors in protecting foods. In some cases, it may be necessary to open doors and use fans to induce circulation.

j. Light

Damage from light is restricted to products that are packed in glass or transparent containers. Exposure causes color changes and may affect the flavor of foods containing oils and fats.

3. Storage Temperatures and Relative Humidity for some food products

<u>Product</u>	<u>Temperatures</u>	<u>Relative Humidity</u>
Frozen meats*	-10° to 0° F	-----
Canned Products	40° to 60° F	50 to 60%
Honey**	40° to 60° F	50 to 60%
Raisins***	40° to 60° F	50 to 60%
Rice, Milled	40° to 60° F	50 to 60%

- * Frozen meat or any other product that is received frozen must be kept frozen.
- ** Honey may crystallize if stored in refrigeration
- *** Raisins stored at 40° (will remain fresher and keep for 18 months)
Raisins stored at 70° to 90° (will only last 5 to 9 months)